IN THE CLAIMS

Please cancel claims 1-4, 6, and 12-45 without prejudice or disclaimer. Claims 5, 8, 11 and 46-48 are currently amended. New claims 49-85 are added. A complete claim listing is shown below:

1-4. (Canceled)

5. (Currently Amended) A process of converting at least one reactant to at least one product comprising:

passing at least one reactant into a reaction chamber;

wherein said reaction chamber comprises ~~the~~ a catalyst ~~of claim 1~~ comprising a porous metal support, a buffer layer, an interfacial layer, and a catalytically active layer on the surface; wherein the porous metal support has an average pore size of from 1 μm to 1000 μm; wherein the porous metal support is selected from the group consisting of foam, felt, and wad;

wherein the buffer layer is disposed between the porous support and the interfacial layer, and the interfacial layer is disposed between the catalytically active layer and the buffer layer;

conversion of said at least one reactant into at least one product; and

passage of the product out of the reaction chamber.

6. (canceled)

7. (Original) The catalytic process of claim 5 wherein said process is selected from the group consisting of: acetylation, addition reactions, alkylation, dealkylation, hydrodealkylation, reductive alkylation, amination, aromatization, arylation, autothermal reforming, carbonylation, decarbonylation, reductive carbonylation, carboxylation, reductive carboxylation, reductive coupling, condensation, cracking, hydrocracking, cyclization, cyclooligomerization, dehalogenation, dimerization, epoxidation, esterification, exchange, Fischer-Tropsch, halogenation,

hydrohalogenation, homologation, hydration, dehydration, hydrogenation, dehydrogenation, hydrocarboxylation, hydroformylation, hydrogenolysis, hydrometallation, hydrosilation, hydrolysis, hydrotreating, hydrodesulferization/hydrodenitrogenation (HDS/HDN), isomerization, methanol synthesis, methylation, demethylation, metathesis, nitration, oxidation, partial oxidation, polymerization, reduction, steam and carbon dioxide reforming, sulfonation, telomerization, transesterification, trimerization, water gas shift (WGS), and reverse water gas shift (RWGS).

8. (Currently Amended) Microchannel apparatus ~~in which at one of the interior walls of the apparatus have~~ comprising a connection between at least two microchannels, wherein the connection has a metal internal surface that has been coated with a buffer layer comprising a metal oxide, wherein the buffer layer has a thickness of between 0.05 μm and 10 μm.

9. (Original) The microchannel apparatus of claim 8 further comprising an interfacial layer disposed on the buffer layer.

10. (Original) The microchannel apparatus of claim 8 wherein the buffer layer has been vapor deposited.

11. (Currently Amended) The microchannel apparatus of claim ~~9~~8, wherein said ~~walls comprise at least one wall of the reaction chamber and further comprising a catalytically active material disposed on the interfacial layer~~ microchannels each comprise at least one metallic wall and wherein said at least one metallic wall of each of the at least two microchannels has been coated with a buffer layer comprising a metal oxide.

12-45. (Canceled)

46. (Currently Amended) A method of making microchannel apparatus comprising:

providing a microchannel apparatus comprising a first layer and a second layer wherein each of said first and second layers comprises at least one microchannel, and, subsequently, vapor depositing a buffer layer on at least one interior wall of a microchannel in each of said first and second layers in said microchannel apparatus.

47. (Currently Amended) A microchannel apparatus made by the method of claim 46 wherein the buffer layer comprises a metal oxide layer.

48. (Currently Amended) The microchannel apparatus ~~method~~ of claim 47 wherein the ~~buffer~~ metal oxide layer has a thickness of between 0.05 μm and 10 μm.

49. (New) The method of claim 46 further comprising a step of depositing an interfacial layer on said buffer layer in each of said microchannels in each of said first and second layers.

50. (New) The method of claim 49 further comprising a step of depositing a catalytically active material in each of said microchannels in each of said first and second layers, either after or simultaneous with said step of depositing an interfacial layer.

51. (New) Microchannel apparatus made by the method of claim 50 further comprising a first heat exchanger adjacent to and in thermal contact with the first layer and a second heat exchanger adjacent to and in thermal contact with the second layer.

52. (New) The microchannel apparatus of claim 51 wherein the at least one microchannel in the first layer has at least one dimension of 1 mm or less; and

wherein the at least one microchannel in the second layer has at least one dimension of 1 mm or less.

53. (New) The microchannel apparatus of claim 52 wherein the first heat exchanger has a thickness of 250 microns to 3 mm; and wherein the second heat exchanger has a thickness of 250 microns to 3 mm.

54. (New) The method of claim 46 wherein the step of providing a microchannel apparatus, comprises:

forming a subassembly by stacking at least one inner thin metal sheet in alternating contact with at least one outer metal thin sheet; wherein the at least one inner thin metal sheet comprises a solid margin around a circumference;

wherein the solid margin defines at least one longitudinal wall of a microchannel in the first layer; and

bonding the subassembly.

55. (New) The method of claim 54 wherein the microchannel in the first layer has at least one dimension of 1 mm or less.

56. (New) The method of claim 46 wherein the first layer comprises plural microchannels that are connected via a header.

57. (New) The method of claim 46 wherein the microchannel apparatus is a laminated microchannel apparatus formed from an assembly of laminae; wherein the first layer is formed from a first laminae and the second layer is formed from a second laminae; and wherein the step of vapor depositing comprises chemical vapor depositing.

58. (New) The microchannel apparatus of claim 46 wherein a connection connects the at least one microchannel in the first layer with the at least one microchannel in the second layer.

59. (New) The microchannel apparatus of claim 51 wherein a connection connects the at least one microchannel in the first layer with the at least one microchannel in the second layer.

60. (New) A process of converting at least one reactant to at least one product comprising:

passing at least one reactant into the microchannel apparatus of claim 51;

conversion of said at least one reactant into at least one product; and

passage of the product out of the microchannel apparatus.

61. (New) The microchannel apparatus of claim 51 wherein the buffer layer contains at least two compositionally different sublayers.

62. (New) The microchannel apparatus of claim 48 further comprising an interfacial layer, and wherein the buffer layer is disposed between the interior wall of a microchannel and the interfacial and has a coefficient of thermal expansion that is intermediate the thermal expansion coefficients of the wall and the interfacial layer.

63. (New) The microchannel apparatus of claim 48 wherein the buffer layer comprises Al_2O_3, TiO_2, ZrO_2, or combinations thereof; and

wherein the buffer layer is less than 5 microns thick.

64. (New) The microchannel apparatus of claim 47 wherein the buffer layer is nonporous.

65. (New) The microchannel apparatus of claim 48 wherein the interfacial layer has a thickness that ranges from 1 to 50 μm and has a BET surface area of at least 1 m^2/g.

66. (New) The method of claim 46 wherein the step of vapor depositing comprises chemical vapor depositing conducted in a temperature range of 250 to 800 °C, and wherein the buffer layer comprises a metal oxide.

67. (New) The microchannel apparatus of claim 48 further comprising an interfacial layer disposed over the buffer layer;

wherein the buffer layer and interfacial layer comprise a coating; and wherein the apparatus possesses thermal cycling stability such that, if exposed to 3 thermal cycles in air, the catalyst exhibits less than 2% flaking of the coating.

68. (New) The method of claim 46 wherein the step of vapor depositing a buffer layer comprises the steps of: vapor depositing a TiO_2 layer; and vapor depositing a dense alumina layer over the TiO_2 layer; and further comprising a step of depositing an interfacial layer that comprises depositing a less dense, high surface area alumina layer over the dense alumina layer.

69. (New) The microchannel apparatus of claim 8 wherein the buffer layer comprises a TiO_2 sublayer in contact with the metallic wall and a dense alpha alumina sublayer disposed over the TiO_2 sublayer.

70. (New) The microchannel apparatus of claim 8 wherein the connection comprises a metal tube or a metal pipe.

71. (New) The microchannel apparatus of claim 8 wherein the buffer layer comprises Al_2O_3, TiO_2, ZrO_2, or combinations thereof.

72. (New) The microchannel apparatus of claim 70 wherein the buffer layer is less than 5 μm thick.

73. (New) The microchannel apparatus of claim 8 wherein the connection is a header that is connected to the at least two microchannels.

74. (New) The microchannel apparatus of claim 73 wherein the header and the at least two microchannels are disposed within the same plane.

75. (New) A method of making microchannel apparatus, comprising:

providing a microchannel apparatus comprising a first layer and a second layer;

wherein the first layer comprises a first microchannel that is defined by at least one first microchannel metallic wall;

wherein the second layer comprises a second microchannel that is defined by at least one second microchannel metallic wall; and

a connection through a layer wherein the connection connects the first microchannel with the second microchannel; and, subsequently,

applying a buffer layer onto at least a portion of the at least one first microchannel wall, and at least a portion of the at least one second microchannel wall.

76. (New) The method of claim 75 wherein the step of providing a microchannel apparatus comprises forming a laminated microchannel apparatus from an assembly of laminae; wherein the first layer is formed from a first laminae and the second layer is formed from a second laminae.

77. (New) The method of claim 75 wherein the step of providing a microchannel apparatus, comprises:

forming a subassembly by stacking at least one inner thin metal sheet in alternating contact with at least one outer metal thin sheet; wherein the at least one inner thin metal sheet comprises a solid margin around a circumference;

wherein the solid margin defines at least one longitudinal wall of a microchannel in the first layer; and

bonding the subassembly.

78. (New) The method of claim 77 wherein the microchannel in the first layer has at least one dimension of 1 mm or less.

79. (New) The method of claim 75 further comprising a step of depositing an interfacial layer on said buffer layer.

80. (New) The method of claim 79 further comprising a step of depositing a catalytically active material in each of said microchannels in each of said first and second layers, either after or simultaneous with said step of depositing an interfacial layer.

81. (New) The method of claim 80 wherein the microchannel apparatus that is provided comprises a first heat exchanger adjacent to and in thermal contact with the first layer and a second heat exchanger adjacent to and in thermal contact with the second layer.

82. (New) The method of claim 81 wherein the at least one microchannel in the first layer has at least one dimension of 1 mm or less; and

wherein the at least one microchannel in the second layer has at least one dimension of 1 mm or less.

83. (New) The method of claim 82 wherein the first heat exchanger has a thickness of 250 microns to 3 mm; and wherein the second heat exchanger has a thickness of 250 microns to 3 mm.

84. (New) The method of claim 75 wherein the at least one first microchannel metallic wall and at least one second microchannel metallic wall are chemically etched and then the buffer layer is deposited by chemical vapor deposition.

85. (New) The method of claim 76 wherein the buffer layer is deposited by chemical vapor deposition and the buffer layer comprises a metal oxide.